

## In the Claims

1 – 12. (CANCELED)

13. (Currently Amended)     ~~The A~~ gas correlation camera ~~comprising of claim 10~~ at least three gas correlation cells, one of said cells filled with a first gas capable of absorbing infrared radiation at one infrared band, and another of said cells filled with a second gas capable of absorbing infrared radiation at another infrared band, and a third of said cells that does not absorb infrared radiation, and wherein the gas correlation camera further comprises a camera with imaging optics and 2-D array detector for determining the spatial distributions of both the spectral and energy content of said first infrared band and the spectral and energy content of said second infrared band and using the third cell as a null (non-absorbing) energy content reference, and wherein measurements are made using two different absorption bands of CH<sub>4</sub>, one at wavelengths shorter than 3 micrometers and one at wavelengths greater than 3 micrometers, thus permitting the use of both solar reflected and terrestrially emitted infrared radiation for remote sensing measurements of CH<sub>4</sub>.

14. (Currently Amended)     ~~The A~~ gas correlation camera ~~comprising of claim 10~~ at least three gas correlation cells, one of said cells filled with a first gas capable of absorbing infrared radiation at one infrared band, and another of said cells filled with a second gas capable of absorbing infrared radiation at another infrared band, and a third of said cells that does not absorb infrared radiation, and wherein the gas correlation camera further comprises a camera with imaging optics and 2-D array detector for determining the spatial distributions of both the spectral and energy content of said first infrared band and the spectral and energy content of said second infrared band and using the third cell as a null (non-absorbing) energy content reference, and wherein measurements are made using two different absorption bands of CO<sub>2</sub>, thus permitting the simultaneous retrieval of atmospheric temperature distributions and CO<sub>2</sub> distributions.

15 – 16. (CANCELED)

17. (Currently Amended)     The A system of claim 16 for measuring the spatial distribution of atmospheric infrared radiation from multiple view angles for tomographic sounding with high specificity to the absorption bands of specific atmospheric gases, said system comprising one or more gas correlation cameras, each of said cameras comprising at least three gas correlation cells, one of said cells filled with a first gas capable of absorbing infrared radiation at one infrared band, and another of said cells filled with a second gas capable of absorbing infrared radiation at another infrared band, and a third of said cells that does not absorb infrared radiation, said system further comprising a camera with imaging optics for determining the spatial distributions of both the spectral and energy content of said first infrared band and the spectral and energy content of said second infrared band and using the third cell as a null (non-absorbing) energy content reference, an aircraft carrying the said one or more gas correlation cameras, and wherein said gas correlation camera(s) is (are) positioned in said aircraft so as to take multi-angle measurements of infrared radiation passing through the same portion of the atmosphere by making repeated observation passes with different viewing geometries.

18. (Currently Amended)     The A system of claim 17 for measuring the spatial distribution of atmospheric infrared radiation from multiple view angles (as required for tomographic sounding) with high specificity to the absorption bands of specific atmospheric gases, said system comprising one or more gas correlation cameras, each of said cameras comprising at least three gas correlation cells, one of said cells filled with a first gas capable of absorbing infrared radiation at one infrared band, and another of said cells filled with a second gas capable of absorbing infrared radiation at another infrared band, and a third of said cells that does not absorb infrared radiation, said system further comprising a camera with imaging optics for determining the spatial distributions of both the spectral and energy content of said first infrared band and the spectral and energy content of said second infrared band and using the third cell as a null (non-absorbing) energy content reference, an aerospace vehicle carrying the said one or more gas correlation cameras, and wherein said gas correlation camera(s) is (are) positioned in said aerospace vehicle so as to take multi-angle measurements of infrared radiation passing through the same portion of the atmosphere by making repeated observation passes with different viewing geometries ~~wherein the aircraft is replaced by an aerospace vehicle.~~

19. (Currently Amended)     ~~The A system of claim 17~~ for measuring the spatial distribution of atmospheric infrared radiation from multiple view angles (as required for tomographic sounding) with high specificity to the absorption bands of specific atmospheric gases, said system comprising one or more gas correlation cameras, each of said cameras comprising at least three gas correlation cells, one of said cells filled with a first gas capable of absorbing infrared radiation at one infrared band, and another of said cells filled with a second gas capable of absorbing infrared radiation at another infrared band, and a third of said cells that does not absorb infrared radiation, said system further comprising a camera with imaging optics for determining the spatial distributions of both the spectral and energy content of said first infrared band and the spectral and energy content of said second infrared band and using the third cell as a null (non-absorbing) energy content reference, an unmanned aerospace vehicle carrying the said one or more gas correlation cameras, and wherein said gas correlation camera(s) is (are) positioned in said unmanned aerospace vehicle so as to take multi-angle measurements of infrared radiation passing through the same portion of the atmosphere by making repeated observation passes with different viewing geometries ~~wherein said aerospace vehicle is an unmanned aerospace vehicle.~~

20. (Currently Amended)     ~~The A system of claim 17~~ for measuring the spatial distribution of atmospheric infrared radiation from multiple view angles (as required for tomographic sounding) with high specificity to the absorption bands of specific atmospheric gases, said system comprising one or more gas correlation cameras, each of said cameras comprising at least three gas correlation cells, one of said cells filled with a first gas capable of absorbing infrared radiation at one infrared band, and another of said cells filled with a second gas capable of absorbing infrared radiation at another infrared band, and a third of said cells that does not absorb infrared radiation, said system further comprising a camera with imaging optics for determining the spatial distributions of both the spectral and energy content of said first infrared band and the spectral and energy content of said second infrared band and using the third cell as a null (non-absorbing) energy content reference, two or more aerospace vehicles carrying the

said one or more gas correlation cameras, and wherein said gas correlation camera(s) is (are) positioned in said two or more aerospace vehicles so as to take multi-angle measurements of infrared radiation passing through the same portion of the atmosphere by making repeated observation passes with different viewing geometries ~~wherein the single aircraft is replaced by a plurality of aircraft so as to take multi-angle measurements of infrared radiation passing through the same portion of the atmosphere with each of the said plurality of aircraft having a different viewing geometry.~~

21 – 53. (Canceled)

54. (Original) A system for tomographic sounding using infrared radiation, said system comprising:

- (a) a plurality of gas correlation cameras, each of said cameras comprising:
  - i) at least two gas correlation cells, one of said cells filled with a first gas capable of absorbing infrared radiation at one infrared band and another of said cells filled with a second first gas capable of absorbing infrared radiation at another infrared band;
  - ii) a camera with imaging optics for determining both the spectral and energy content of said first infrared band and the spectral and energy content of said second infrared band; and
- (b) a plurality of aerospace vehicles, each carrying one of said plurality of gas correlation cameras.

55. (Original) The system of claim 54 wherein at least two of said plurality of gas correlation cameras are positioned in at least two of said plurality of aerospace vehicles so as to take measurements of infrared radiation emanating from the ground.

56. (Original) The system of claim 55 wherein said at least two correlation cameras are further positioned to take measurements of infrared radiation emanating at least in part from the same area of ground.

57. (Original) The system of claim 54 wherein said aerospace vehicle is an unmanned aerospace vehicle.

58. (Original) A system for tomographic sounding using infrared radiation, said system comprising:

(a) a gas correlation camera comprising;

- i) at least two gas correlation cells, one of said cells filled with a first gas capable of absorbing infrared radiation at one infrared band and another of said cells filled with a second first gas capable of absorbing infrared radiation at another infrared band;
- ii) a camera with imaging optics for determining both the spectral and energy content of said first infrared band and the spectral and energy content of said second infrared band, and

(b) an aerospace vehicle carrying one of said gas correlation cameras.

59. (Original) The system of claim 58 wherein said gas correlation camera is positioned in said aerospace vehicle so as to take repeated measurements of infrared radiation emanating from the same area of ground when said aerospace vehicle makes repeated passes over said same area of ground.

60. (Original) The system of claim 58 wherein said aerospace vehicle is an unmanned aerospace vehicle.